TOOTHBRUSH

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The invention pertains to the field of toothbrushes. More particularly, the invention pertains to a toothbrush designed to have improved teeth cleaning and massaging abilities.

DESCRIPTION OF RELATED ART

Toothbrushes are generally designed to clean the surfaces of the teeth and gums, the areas between adjoining teeth, and the marginal areas between the teeth and the gums, as well as removing dental plaque in these areas. Brushing with a toothbrush also massages the gums, which is highly effective in preventing periodontitis.

Toothbrush Bristles

The sweeping action of toothbrush bristles removes food particles and debris from the surfaces of the tooth. The ends of the bristles are the active cleaning agent of the whole toothbrush. Although the ends of the bristles are rounded off in the manufacturing process, they are still relatively sharp and potentially harmful due to the small diameter of the bristles. The bristles work by cumulatively acting like a rough flat, curved or stepped surface, which in theory and practice acts as an effective cleaning tool. The amount of force applied to the brush, the rigidity of the bristles and the extent of end rounding of the bristles determine to a great extent the intrinsic effective cleaning action of the brush. In the mouth, there are relatively delicate tissues in close proximity to the teeth, namely the gums and gingiva. This situation begs the question of how to clean the teeth without seriously harming the gums and surrounding soft tissues.

Bristle tips play a significant role in cervical abrasion and gingival recession (where the predisposing factors are present). Despite the fact that all human mouths are basically the same, with the exception of persons with braces, bridgework and implants, over two dozen fundamentally different types of basic toothbrushes are on the market

today. Many toothbrushes have rigidly mounted bristles and a rigid curved or angled bristle surface. These toothbrushes have inherent disadvantages. For example, placing these type of bristles on flat tooth surfaces results in fewer bristles making contact with the teeth. The bristles that do contact the teeth must support the brushing forces applied through the handle, which results in premature splaying of the bristles. Some toothbrushes have elongated rigidly mounted tip bristles which may have improved access to the teeth.

Another drawback of current toothbrushes is that applying sufficient pressure for good cleaning often damages or irritates the softer, adjacent gums. Prior art toothbrush manufacturers have tried to solve this problem by modifying the configuration of the brush, or by varying bristle hardness or length. However, there is currently no single configuration that is optimal under all conditions.

There have been a number of toothbrush head and bristle configurations patented in the past. Most of the previously described toothbrush head and bristle configurations are based on a model where the effective working part of the toothbrush is the bristle or more specifically the ends of the bristle.

U.S. Patent No. 2,317,485, "BRUSH," Rider (1943), discloses a toothbrush which has bristles having a cross-section shaped like a polygon with simple flat sides.

U.S. Patent No. 2,599,191, "DENTAL BRUSH HAVING LOOPED BRISTLES," Meunier (1952), discloses a toothbrush head and bristle configuration based on the fact that the sides of the shaft of the bristle could provide a less traumatic cleaning action especially with persons with sensitive gums. This patent teaches the bristles looping back on themselves forming a simple loop. These loops are duplicated side by side to form a series thereby forming a working head of a toothbrush. The effective working areas of this brush however are curved points of contact on the looped tufts and this greatly reduces its cleaning potential compared to regular toothbrushes. This toothbrush is atraumatic in its functioning but is not a very effective cleaning agent.

U.S. Patent No. 2,637,893, "ARTIFICIAL FILAMENT," Shaw (1953), shows an artificial filament to be used in push brooms, whisks, brushes and related articles. The bristles in these filaments have a lobed appearance in cross-section.

U.S. Patent No. 2,876,477, "BRUSH," Stewart (1959), discloses a toothbrush having bristles with a basic polygon shape in cross-section. The sides of the bristles are concave so the effective angles are more acute than in the patents with simple flat sides.

U.S. Patent No. 5,991,957, "TOOTHBRUSH," Watanabe (1999), teaches a toothbrush which has bristles shaped like a polygon in cross-section with simple flat sides.

U.S. Patent No. 6,138,314, "TOOTHBRUSH WITH IMPROVED CLEANING AND ABRASION EFFICIENCY," Schiff et al. (2000), shows a toothbrush with bristles which are star-shaped in cross-section.

With the exception of U.S. Patent No. 2,599,191, all of these patents changed the basic intrinsic shape of the bristles without changing the arrangment of the bristles in the head of the toothbrushes. Similar to other conventional toothbrushes, the ends of the bristles in these inventions still play a significant part in the cleaning process.

Toothbrush handles

Toothbrush handles currently available have many deficiencies. For example, most toothbrush handles are too small to grip firmly. Depending on the size of a user's hand, there exists a minimum size of a gripped elongated objected below which manipulation becomes difficult. The size of the handle should be large enough to allow enough pressure to be placed on it with the fingers to allow adequate manipulation. With this in mind, most currently available toothbrush handles are inadequate. In addition, the general square or rectangular shaped cross section of existing toothbrush handles is not the ideal shape for a comfortable grip in the palm.

The preferred and most common technique for brushing teeth is generally known as the Bass technique. In this technique, the toothbrush bristles are placed at about a 45 degree angle toward the gum tissues. With a vibrating or circular motion, the bristles are flexed so they surround the gum tissues and the portion of the tooth closest to the gumline. This type of motion also massages and stimulates the gingiva. The plaque is usually heaviest on the third of the tooth closest to the gumline. Once this area of the tooth is cleaned, the brush can be swept up (for lower teeth) and down (for upper teeth) to help remove the plaque from the remaining facial and lingual tooth surfaces. This must be done

in a systematic manner around the mouth so no tooth is missed. Pressure must be light so as not to damage the gingival tissues. Since this brushing method is difficult and requires maneuvering and dexterity, most people do not currently use it. There is no toothbrush currently available which makes it easier to use this technique.

Since current toothbrush handles are not made to facilitate the Bass technique, it makes it even more difficult to perform. The thumb plays a vital role in maneuvering the toothbrush for proper cleaning. To properly carry out the Bass technique, as well as other advocated brushing methods (e.g., the Stillman technique), the handle has to be gripped with the thumb at all times. While cleaning all areas of the teeth, the thumb is placed in succession on all four sides of the toothbrush handle. However, most toothbrush handles have only one thumb grip which is flat and inadequate. Some of the more expensive toothbrushes have another thumb rest which is situated opposite to the first on the back of the handle. However, thumb grips are needed on all four sides of the handle, especially to perform the Bass Technique.

Therefore, there is a need in the art for both an improved bristle configuration and an improved toothbrush handle to allow more efficient teeth cleaning.

SUMMARY OF THE INVENTION

The present invention is a toothbrush with novel bristles and/or a novel handle. The toothbrush has a better grip and a better massaging effect than in the prior art. The effective areas of bristle contact are preferably flat sections, which increase the total area of contact. The bristles in the present invention are shaped like a polygon in cross-section. The polygon-shaped bristles preferably have three to six sides, and the polygon is preferably a regular polygon. The points of contact on the tooth are the edges of the polygon. When the cleaning direction of the brush is perpendicular to the long axis of the bristle, the effective cleaning agent is a cleaning edge equivalent to the corner of the polygon. The bristles are twisted in a spiral (screw-like) pattern to allow for the tooth to be in touch with only the edges of the sides of the polygon and not the flat side of the polygon. The edges of the bristles are preferably always in contact with the tooth. The toothbrush handle preferably has at least four thumb grips. The thumb grips are preferably concave areas with raised parallel ridges to minimize slip and maximize friction under wet

conditions. The handle has a general elongated shape that is preferably slightly elliptical. In a preferred embodiment, each thumb grip area has a layer of soft non-slip material covering it.

In a preferred embodiment, the bundles of bristles are arranged at 90 degrees to each other. The two diametrically opposed sets of bristles serve dual purposes, depending on the direction of movement or brushing. When the general motion of the brush is perpendicular to the long axis of the bristle, there is a cleaning action. However, if the motion is parallel to the axis then a massaging action is being carried out on the gums. In this configuration, one set of bristles is always cleaning the teeth while the adjacent set is massaging the teeth.

In another embodiment, the bristles are more resilient and rigid than conventional soft and medium bristles. This ensures that the flat working portion of the bristle does not give in and bend too much while brushing.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A shows a single bristle bent into the functional shape of the bristle in an embodiment of the invention.

Fig. 1B shows a grouping of the bristles shown in Fig. 1A, in a working bristle section in an embodiment of the invention.

Fig. 2A shows a cross-section of a triangular bristle shape in an embodiment of the present invention.

Fig. 2B shows a cross-section of a square bristle shape in an embodiment of the present invention.

Fig. 2C shows a cross-section of a pentagonal bristle shape in an embodiment of the present invention.

Fig. 2D shows a cross-section of a hexagonal bristle shape in an embodiment of the present invention.

Fig. 3A shows an example of the square bristle shape shown in Fig. 2B, in a twisted screw-like configuration in an embodiment of the invention.

Fig. 3B shows an example of the hexagonal bristle shape shown in Fig. 2D, in a twisted screw-like configuration in an embodiment of the invention.

Fig. 4A shows a top-down view of a complete head of a toothbrush with the bristle sections in an embodiment of the present invention.

Fig. 4B shows a side view of a complete head of a toothbrush with the bristle sections in an embodiment of the present invention.

Fig. 4C shows a front view of a complete head of a toothbrush with the bristle sections in an embodiment of the present invention.

Fig. 5 shows an isometric view of the toothbrush shown in Fig. 4A through Fig. 4C.

Fig. 6 shows a configuration of the bristle sections in an alternative embodiment of the invention.

Fig. 7 shows a configuration of the bristle sections in an alternative embodiment of the invention.

Fig. 8 shows a configuration of the bristle sections in an alternative embodiment of the invention.

Fig. 9A shows a configuration of the handle with thumb grips on all four sides in a preferred embodiment of the invention.

Fig. 9B shows a side view of the handle shown in Fig. 9A.

DETAILED DESCRIPTION OF THE INVENTION

This invention seeks to maximize the use of the sides of the bristles in the cleaning process by creating and utilizing working edges on the sides and by introducing a new bristle arrangement. In addition, multiple thumb grips on the toothbrush handle allow for easier execution of the advocated cleaning methods including the Bass technique, which

also increases the effectiveness of cleaning the teeth. Since there are no bristle tips present, this invention removes the harmful effects that the ends of the bristles cause. The working portion of the bristles is totally shifted to the sides. This invention is better at cleaning than previous (traditional) toothbrushes.

Toothbrush Bristles

The total area of the bristles in contact with the tooth should be maximized to clean effectively. The bristles in this invention are flattened. The effective areas of contact are not curved sections of the bristles as in U.S. Patent No. 2,599,191, but are flat sections, which increase the total area of contact. Instead of being round in cross-section as in regular toothbrush bristles, the bristles of the present invention are shaped like a polygon. This unique shape makes them more effective cleaners. The polygon preferably has between three and six sides. The edges of the polygon act as the lines of contact with the tooth. When the cleaning direction of the brush is perpendicular to the long axis of the bristle, the effective cleaning agent is a cleaning edge equivalent to the corner of the polygon.

With this configuration, however, there is the possibility that a significant number of bristles only contact the tooth on their flat faces, which would be a less effective cleaner than a round bristle. Twisting the bristles in a spiral (screw-like) pattern allows the tooth to be in contact primarily with the corners of the sides of the bristles, thereby solving this problem. Unlike U.S. Patent No. 2,599,191, the total area in contact with the tooth is increased significantly by having flat portions of the bundle of bristles coming in contact with the tooth. To ensure that the flat working portion of the bristle does not give in and bend too much while brushing, the bristles are preferably a bit more resilient and rigid than the regular soft and medium bristles in a preferred embodiment.

During brushing only the flat part of the bristle comes in contact with the tooth surface, and even under undue force, it is still only a flat section of the bristle in contact with the tooth. The flat sections of the bristles give slightly under pressure to form a curve that fits the curves of the inner and outer portion of the teeth. Unlike traditional brushes, the configuration of the bristles ensures that there is no brushing method that actually does harm to the tooth or gums. The flat portion of the bristles cleans the sides of the teeth

while the sections perpendicular to the surfaces of the teeth clean the areas between the teeth. The sections of the bristle parallel to the gum line gently glide between the tooth and gum and remove any food particles and debris that are found there.

There are many benefits to the bristle configuration design over the prior art. Clinically, this design cleans the teeth better. It also has a better massaging effect on the gums. In addition, there is reduced cervical erosion or abrasion, and the bristles are never traumatic. A toothbrush with these bristles is also easier to manufacture. The larger diameter bristles make it easier to work with. Also, there are fewer bundles or tufts of bristles to work with than in the prior art. In addition, the bristle ends require no trimming or rounding off.

Referring to Figs. 1 through 5, the bristles (7) in this invention have the shape of a polygon in cross section. Some examples of these shapes include regular polygons such as a triangular-shaped bristle (1), a square-shaped bristle (2), a pentagon-shaped bristle (3), and a hexagonal-shaped bristle (4), although other polygons, including other rectangles, are also possible. Rectangles are just as effective as squares, but since the bristle is preferably twisted, it is easier to work with squares. The edges of regular polygons with seven or more sides are almost flat and ineffective. When the internal angle of the edge goes above 120°, then the bristle is relatively flat and loses its effective scraping action. Therefore, a regular polygon from three to six sides is preferred. Since the edges of a triangle could potentially be too sharp and could wear down quickly with use, a regular polygon having four to six sides is further preferred.

These bristles (7) are preferably twisted into a screw or spiral shape. Both a twisted square-shaped bristle (5) and a twisted hexagonal-shaped bristle (6) are shown. The spiral pattern decreases the number of bristles where only the flat surface of the polygon comes in contact with the tooth. This allows the tooth to be almost exclusively in contact with the edges of the bristles (7). The total area in contact with the tooth is increased significantly by having flat portions of the bundle of bristles coming in contact with the tooth. There are preferably enough complete revolutions per centimeter to ensure that there is always an edge of the bristle that is facing outward and in contact with the tooth surface. The spiral pattern also decreases the total area occupied by the bristles (7).

The number of revolutions depends on the number of sides of the polygon. As the number of sides of the polygon increases, the number of revolutions required to bring another edge in contact with the tooth decreases. For example, when an edge of a triangle is rotated around and away from the tooth, it must be rotated 120° before another edge is brought back in line and in contact with the tooth. In contrast, a hexagon only needs to be rotated 60° to bring another edge in line with the tooth. The edge preferably does not form an angle greater than 45° with the long axis of the bristle. Ideally, the angle is zero. In a preferred embodiment, approximately one revolution per 2mm is used.

The bristles (7) of the toothbrush preferably form inverted or upside down 'U's. These inverted 'U's are bundled together to form tufts (8). The two free ends (25) of the tufts (8) are embedded, like regular tufts, in the head (26) of the toothbrush (11). In this embodiment, the flat 'roof' section (27) of one inverted 'U' (9) forms a right angle with the roof section (27) of adjacent tufts of bristles (10). In a preferred embodiment, the tufts have enough bristles to closely pack a cross-sectional area of 5mm x 2mm. The number of bristles depends on the thickness of the bristles, which is preferably about 0.012 inches in diameter. The bristles are preferably of nylon type 6.12.

The two diametrically opposed sets of bristles (9) and (10) serve dual purposes depending on the direction of movement or brushing. When the general motion of the brush is perpendicular to the long axis of the bristle there is a cleaning action, while when the motion is parallel to the axis then a massaging action is being carried out on the gums. The bundles of bristles (9) and (10) are arranged at 90° to each other in the embodiment shown in Figs. 4 and 5. Regardless of the direction of motion, one set of bristles (9) or (10) is always cleaning the teeth while the adjacent set is massaging the teeth. In addition, the flat sections (27) of the bristles give slightly under pressure to form a curve that fit the curves of the inner and outer surfaces of the teeth.

Although this arrangement seems to be the most effective, other bristle arrangements are possible using the same principle. For example, referring to Fig. 6, sets of bristles (13) are sandwiched between two additional sets of bristles (14) which are perpendicular to the first set of bristles (13) of the toothbrush (12). This configuration functions similarly to the configuration shown in Fig. 5. Regardless of the direction of

motion, one set of bristles (13) or (14) is always cleaning the teeth while the adjacent set (13) or (14) is massaging the teeth.

Referring to Fig. 7, the toothbrush (15) has only bristles (17) that are perpendicular to the long axis of the toothbrush (15). These bristles create one uniform section (16). Although this configuration has minimal gingival cleaning, it has maximum tooth cleaning properties. Referring also to Fig. 8, the toothbrush (19) has separate bristle sections (18), each creating a tuft. This arrangement has maximum gingival cleaning and minimum tooth cleaning properties.

There are additional variations to the bristle design, which include having the end group of bristles taller and stiffer than the others (a power tip configuration) to help clean the back section of back teeth. Alternatively, the working flat sections (27) of the bristles are at forty-five degrees to the long axis of the brush.

Toothbrush handle

The toothbrush handle of the present invention is large enough to have a comfortable grip without being too bulky. The general elongated shape is slightly elliptical. In reference to the Bass brushing technique, the toothbrush handle is stabilized with a properly placed thumb on a thumb grip.

The longitudinal cross section of the shape that best approximates the shape formed by the inside of curved fingers and palm is mildly elliptical. Therefore, referring now to Figs. 9A and 9B, the toothbrush handle extension (21) is slightly elliptical in cross section and generally elongated. The central portion of the handle (20) has the largest diameter of the handle (20) so that it fits into the curvature of a user's palm. In a preferred embodiment, the central portion of the handle (20) is approximately ¾ inch to 1 inch in diameter and circular in cross section. There are at least four thumb grips (22). The thumb grips (22) are preferably concave areas with raised parallel ridges (23) to minimize slip and maximize friction under wet conditions. In a preferred embodiment, each thumb grip (22) has a layer of soft non-slip material covering it.

Accordingly, it is to be understood that the embodiments of the invention herein described are merely illustrative of the application of the principles of the invention.

Reference herein to details of the illustrated embodiments is not intended to limit the scope of the claims, which themselves recite those features regarded as essential to the invention.